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09/814,025	03/20/2001	Linard Karklin	NTI-004	3002

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EXAMINER

AZARIAN, SEYED H

ART UNIT PAPER NUMBER

2625

DATE MAILED: 03/29/2004

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/814,025

Applicant(s)

LINARD KARKLIN

Examiner

Seyed Azarian

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 March 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-44 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 14,15,39,43 and 44 is/are allowed.
- 6) ☒ Claim(s) 1-13,16-38,41 and 42 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 March 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3,4,5,6.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

Claims 6-13, 16-38 and 40-42, are rejected under 35 U.S.C. 102(e) as being anticipated by Miyano (U.S. patent 6,647,147).

Regarding claim 6, Miyano discloses a method of repairing a mask, the method comprising: determining an edge roughness of a feature on the mask (column 10, lines 47-56, the degree of the edge roughness of the contour of the reticle pattern and the like);

wherein if the edge roughness is outside a predetermined value mask (column 10, lines 30-41, the correction pattern region and differential region having an area equal to or wider than a predetermined threshold also Fig. 14, column 10, lines 11-29, as the correction pattern region implies that even the region which is not the correction pattern is extracted as the correction pattern region);

then using a lithography tool to repair the mask (column 9, line 62 through column 10, line 10, lithography process and masking).

Regarding claim 7, Miyano discloses the method of Claim 6, wherein the predetermined value is selected by a user (column 16, lines 26-40, range correction determined by engineer).

Regarding claim 8, Miyano discloses the method of Claim 6, wherein determining the edge roughness includes determining a centerline of the feature based on a defect-free representation of the feature (Fig. 14, column 10, lines 43-60, predetermined threshold is a threshold to separate the differential region between the standard Fig. 14 and contour caused by the edge roughness).

Regarding claim 9, Miyano discloses the method of Claim 6, wherein the feature is a contact (Fig. 19, column 15, lines 16-25, chromium).

Regarding claim 16, Miyano discloses a method of repairing a mask, the method comprising: determining any corner rounding of a contact on the wafer, wherein if the edge roughness is outside a predetermined value, then using a lithography tool to repair the wafer (Fig. 6 and 7, column 8, line 47 through column 9, line 6, as the contour the portion in which the concentration is sharply changed by a correction pattern).

Regarding claim 19, Miyano discloses an integrated circuit comprising a plurality of features for performing a function and at least one repaired feature (Fig. 3, column 12, lines 16-26, automatically extracted as the correction pattern region between the differential region caused by the edge roughness of the contour).

Regarding claim 22, Miyano discloses the integrated circuit, of Claim 19, wherein the at least one repaired feature includes an OPC feature (column 2, lines 1-12, effect is corrected by optical proximity).

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Regarding claim 23, Miyano discloses the integrated circuit of Claim 19, wherein the at least one repaired feature includes one of a hammerhead, a serif, and a bias (column 7, lines 38-45, power supply).

Regarding claim 24, Miyano discloses a mask inspection system, the system comprising, means for generating a simulated wafer image of a feature on a mask; means for determining a centerline for the simulated wafer image based on a defect-free representation of the feature; and means for measuring an aspect of the simulated wafer image based on the centerline (Fig. 11, column 11, lines 60-67, correction pattern based on the center of gravity).

Regarding claim 27, Miyano discloses the system of Claim. 26, further including a mask repair tool receiving signals from the means for evaluating possible repairs (column 15, line 66 through column 16, line 5, to evaluate the reticle pattern).

Regarding claims 10-13, it recites similar limitation as claims 6, 7, 8 and 9, are similarly analyzed.

Regarding claims 17-18 and 20-21, it recites similar limitation as claims 7, 8 and 9, are similarly analyzed.

Regarding claims 25-26, 28, 30 and 36-38, it recites similar limitation as claims 6, 16 and 27, are similarly analyzed.

Regarding claims 29, 31-35 and 40-42, it recites similar limitation as claims 6, 8, 24 and 27, are similarly analyzed.

Claim Rejections - 35 USC § 103

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2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 1-5, are rejected under 35 U.S.C. 103(a) as being unpatentable over Miyano (U.S. patent 6,647,147) in view Kane (U.S. patent 6,556,703).

Regarding claim 1, Miyano discloses a method for determining edge roughness of a feature in a mask, the method comprising, determining a centerline of the feature based on a representation of the mask (Fig. 14, column 9, lines 24-41, the correction pattern region is measured, and area, a center of gravity, a maximum diameter in a horizontal or vertical direction);

measuring a first length of a first rib extending from the centerline to one edge of the feature (column 10, lines 47-60, predetermined threshold is a threshold to separate the

differential region between the standard Fig. 14 and contour caused by the edge roughness of contour);

measuring a second length of a second rib extending from the centerline to the one edge of the feature (Fig. 7 and 14, column 10, lines 47-56, the degree of the edge roughness of the contour of the reticle pattern and the like (more than one edge roughness);

However Miyano fail to disclose, "comparing the first and second edge roughness". On the other hand Kane teaches determining the roughness of the edge of the line 700 of the line 710 is to compare multiple average intensities in the X and Y direction (Fig. 23, column 6, lines 12-24).

Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the system of Miyano according to the teaching of Kane because by comparing the edge roughness on the substrate or other integrated circuit, the inspection device can easily be implements in an masking device such as lithography tool.

Regarding claim 2, Miyano discloses the method of Claim 1, wherein the representation includes a layout of the mask (column 9, line 63 through column 10, masking process).

Regarding claim 3, Miyano discloses the method of Claim 1, wherein the representation includes a layout of one layer of an integrated circuit (column 9, lines 63-67 lithography process (used in a process for manufacturing a semiconductor integrated circuit)).

Regarding claim 4, Miyano discloses the method of Claim 1, wherein the feature is a line (Fig. 19 and 20, contour of line pattern).

Regarding claim 5, Miyano discloses the method of Claim 1, wherein the feature is a contact (Fig. 19, column 15, lines 16-25, chromium).

Allowable claims

4. The following is an examiner's statement of reasons for allowance.

The claim 15, is allowable due to the providing a plurality of theoretical cuts through the contact in a first direction substantially perpendicular to the first direction, wherein each cut provides a second critical dimension extending from a third edge of the contact to a fourth edge of the contact; and comparing the first and second critical dimensions to determine the symmetry of the contact.

The closest prior art of record (Miyano) teaches a method for measuring fine pattern, and record medium that can store therein program to measure fine pattern and can be read by using computer. Kane teaches scanning electron microscope system and method of manufacturing an integrated circuit. But neither teach or suggest the first direction substantially perpendicular to the first direction, wherein each cut provides a second critical dimension extending from a third edge of the contact to a fourth edge of the contact; and comparing the first and second critical dimensions to determine the symmetry of the contact.

These key features in combination with other features of the claimed invention are neither taught nor suggested by the art of record.

Claims 14, 39, 43 and 44, recites substantial very similar limitations as claim 15 above and is allowed for the same reason.

Claims 14-15, 39, 43 and 44 are allowable.

Other prior art cited

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

U.S. patent (5,825,647) to Tsudaka is cited for correction method and correction apparatus of mask pattern.

U.S. patent (5,326,659) to Liu et al is cited for method for making masks.

U.S. patent (5,572,598) to Wihl et al is cited for automated photomask inspection apparatus.

U.S. patent (6,171,731) to Medvedeva et al is cited for hybrid aerial image simulation.

U.S. patent (6,016,357) to neary et al is cited for feedback method to repair phase shift masks.

U.S. patent (6,023,328) to Pierrat is cited for photomask inspection method and apparatus.

Contact Information


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Seyed Azarian whose telephone number is (703) 306-5907. The examiner can normally be reached on Monday through Thursday from 6:00 a.m. to 7:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh Mehta, can be reached at (703) 308-5246. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application information Retrieval (PAIR) system. Status information for published application may be obtained from either Private PAIR or Public PAIR.

Status information about the PAIR system, see [http:// pair-direct.uspto.gov](http://pair-direct.uspto.gov). Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



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February 16, 2004